II. *An Account of ſome Experiments of Light and Colours, formerly made by Sir* Iſaac Newton, *and mention'd in his Opticks, lately repeated before the* Royal Society *by* J. T. Deſaguliers, F. R. S.

THE manner of ſeparating the primitive Colours of Light to ſuch a Degree, that if any one of the ſeparated Lights be taken apart, its Colour ſhall be found unchangeable, was not publiſhed before Sir Iſ. Newton*'s Opticks came abroad. For want of knowing how this was to be done, ſome Gentlemen of the Engliſh College at* Liege, *and Monſieur* Mariotte *in* France, *and ſome others took thoſe for primitive Colours, which are made by immitting a Beam of the Sun's Light into a dark Room through a ſmall round Hole, and refracting the Beam by a triangular Priſm of Glaſs placed at the Hole. And by trying the Experiment in this manner, they found that the Colours thus made were capable of change, and thereupon reported that the Experiment did not ſucceed. And lately the Editor of the* Acta Eruditorum *for* October 1713. pag. 447, *deſired that Sir* Iſ. Newton *would remove this Difficulty.* Objectiones, *inquit*, quas Viri docti tum in Gallia tum in Anglia contra illam [de Coloribus] Theoriam fecere, feliciſſime diluit Vir perſpicaciſſimus *Newtonus*, quemadmodum ex Tranſactionibus Anglicanis N. 84, 85, 88, 96, 97, 121, 123, 128 abunde conſtat. Unde multi optant ut mentem ſuam aperire dignetur de difficultate ab ingenioſiſſimo *Mariotto*, rerum naturalium (dum viveret) ſcrutatore indefeſſo nec infelici, in Tractatu de Coloribus p. 207. & ſeq. contra eam mota. In diſtantia ſcilicet 25 circiter aut 30 pedum, charta excepit radium ſolidum per exiguum foramen in cameram obſcuram immiſſum,

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& per Priſma vitreum trigonum tranſmiſſum, coloremque violaceum ſpatium majus quam trium linearum occupantem per crenam duarum linearum trajectum, alio Priſmate excepit admodum oblique oppoſito : quo facto quandam ejus partem in Rubrum & Flavum tranſmutari obſervavit. Similiter luminis rubri partem in cœruleum & violaceum tranſmutari expertus eſt. Hac verò tranſmutatione admiſſa corruere Theoriam Newtonianam, ex Actis A. 1706. p. 60. & ſeq. manifeſtum eſt. Aſſumpſit autem *Mariottus* diſtantiam 30 pedum, ne quis exciperet in minori diſtantia nondum factam eſſe plenariam radiorum heterogeneorum ſeparationem. Nobis experimentum *Mariotti* tum demum videretur deciſivum, ſi lumen cœruleum integrum in aliud mutatum fuiſſet. *Thus far the Editor of the* Acta. *In anſwer to which it is to be obſerved that the Red and Yellow which came out of the Violet, and the Blew and Violet which came out of the Red, might proceed from the very bright Light of the Sky next encompaſſing the Sun, and that ſeveral ſorts of Rays which come from ſeveral Parts of the Sun's Body are intermixt in all parts of the coloured* Spectrum *which falls upon a Paper at any Diſtance from the Priſm. In this manner of trial, for making the Experiment ſucceed, the Light of the bright Clouds, immediately ſurrounding the Sun, ſhould be intercepted by an opake Skreen placed in the open Air without, at the diſtance of Ten or Twenty Foot from the Hole through which the Sun ſhines into the dark Room. And in the Skreen there ſhould be a ſmall Hole for the Sun to ſhine through. The Hole may be either round or oblong, and not above one eighth or one tenth Part of an Inch broad ; ſo that the Skreen may intercept not only the bright Light of the Clouds next encompaſſing the Sun's Body, but alſo the greateſt Part of the Sun's Light. For thereby the Colours will become leſs mixed. The Beam of Light which paſſes through this Hole muſt afterwards paſs through the other Hole into the dark Room, and the Priſm muſt be placed parallel to the oblong Hole in the*

Skreen, and the refracting Angle thereof be ſixty Degrees or above. In this manner the Experiment may be tried with Succeſs, but the Trial will be leſs troubleſome if it be made in ſuch a manner as is deſcribed in the fourth Propoſition of the firſt Book of Sir Iſ. Newton'*s Opticks.*

Sir Iſaac Newton *therefore, upon reading what has been cited out of the* Acta Eruditorum, *deſired Mr.* Deſaguliers *to try the Experiment in the manner deſcribed in the ſaid Propoſition; and he tried it accordingly with Succeſs before ſeveral Gentlemen of the* Royal Society, *and afterwards before Monſieur* Monmort *and others of the* Royal Academy *of* Sciences; *and ſtill ſhews it to thoſe who deſire to ſee it. How this and other concomitant Experiments were tried and ſucceeded, is deſcribed as follows.*

EXPERIMENT I.

Having ſew'd together end-wiſe two Pieces of Ribbon four Inches long each, the one blew and the other red, whoſe common Breadth was ¾ of an Inch; I cauſ'd it to be held in ſuch manner, that the Light which fell from the Clouds thro' the Window was ſo reflected, that the Angle made by the Rays of Light, which came in at the Middle of the Window, with the Plane of the Ribbon produced, was equal to the Angle made by a Line drawn from the Ribbon to my Eye and the ſaid Plain of the Ribbon. My Eye was plac'd as far behind the Ribbon as the Window was before it, the Diſtance from which to me was about 12 Feet. Then looking thro' a Priſm at the Ribbon, it appear'd broken aſunder in the Place where the blew and red Half join'd. If the Priſm was held with the refracting Angle downwards (or laid with one of its Planes flat upon the Noſe) the blew Half of the Ribbon appear'd to be carried down lower than the red, as at *B*, *R* in *Fig.* 1. but if the refracting Angle of the Priſm was turn'd upwards

wards (as when the Priſm has one of its Planes laid flat to the Forehead) then the blew Half of the Ribbon was lifted up, as at ϐ ρ.

The Priſm was of white Glaſs, having every Angle of 60 Degrees: but when inſtead of it, one of a greeniſh ſort of Glaſs, ſuch as Object Glaſſes of Teleſcopes are made of, was uſed, having the refracting Angle which I look'd thro' of about 48 Degrees; the ſame Phænomenon was more diſtinct, this Glaſs having no Veins, but the Red and Blue were nearer to a ſtreight Line: in ſuch manner that if *A* repreſent the Ribbon ſeen through the firſt Priſm, *B* will repreſent the Ribbon ſeen thro' the ſecond Priſm, *Fig.* 2. If the refracting Angle of the laſt Priſm had been as great as that of the firſt, the Light being tranſmitted thro' too great a Body of greeniſh Glaſs, the Phænomenon would not have ſucceeded ſo well.

The blue Ribbon being ſomewhat too pale, and the red a little dull; I repeated the Experiment with a Skeen of blue, and one of red Worſted join'd together in the Middle as the Ribbons were before; and, the Colours of both being very intenſe, the Experiment ſucceeded better with both Priſms. All that were preſent trying the Experiment found it to ſucceed, and that every Circumſtance anſwer'd to the Account given in *Prop.* 1. *Theor.* 1. *Book* 1. of Sir *Iſaac Newton*'s *Optics*, as far as the Directions there given were followed. So that it appear'd that the Blue being carried lower than the Red in the firſt caſe, and lifted higher in the ſecond, was owing to the greater Refraction of the blue Ray: for tho' each Part of the Ribbon or Worſted reflected all manner of Rays, yet the Phænomenon was very apparent; as alſo that the blue Ribbon or Worſted reflected the blue Rays more copiouſly than the red Rays, and that the red Ribbon or Worſted reflected the red Rays more than the blue ones, becauſe the Red of the blue Half ſeen thro' the Priſm was leſs intenſe than that of the red Half, and the Blue or Purple of the red Half ſeen thro' the Priſm was leſs intenſe than that of the blue Half.

N. B. If the Ribbon or Worſted is laid upon any enlightned Body, the Phænomenon will not ſucceed ſo well; the Colours of the Body ſeen thro' the Priſm mixing with thoſe of the Ribbon or Worſted. Even a black Body will not do, if Light falls upon it; but there muſt be a black Cloath behind, in ſuch manner that no Light falling upon it can be reflected ſo as to diſturb the Phænomenon. And if a ſhort-ſighted Perſon looks through the Priſm, a concave Lens between his Eye and the Priſm will render the Phænomenon more diſtinct than it wou'd otherwiſe be.

EXPERIMENT II.

Some Days after, the Sun ſhining, I made two Holes *H*, *h*, in the Window Shut *S s*, of a darkned Room; thro' which letting the Suns Beams paſs, by means of two Priſms *A*, *B*, (one near each Hole) I open'd the Rays coming from the Sun into the two colour'd *Spectra* α, β, where the following Colours were very diſtinct, *viz.* Red, Orange, Yellow, Green, Blue, Purple and Violet. Now the Reaſon of their being more diſtinct than ordinary, was, that the Priſms which I made uſe of were made of the greeniſh Glaſs mentioned before; which is very free from thoſe Veins by which the Colours are too much thrown into one another, by the beſt white Priſms of the common ſort.

The foremention'd colour'd *Spectra* being thrown into the Room, to the Diſtance of about 20 Feet from the Window where the Sun's Light came in, I caus'd a Piece of white Paper π, ¼ Inch broad and 5 Inches long, to be held within the refracted Rays, (at the Diſtance of 10 Feet from the Windows,) which produc'd theſe Colours in ſuch manner, that by turning the Priſms round their

Axes, I cou'd make the red Ray of the *Spectrum*, made by the one Priſm fall upon one half of the Paper, and the purple Ray of the *Spectrum* made by the other Priſm fall upon the other Half; for the *Spectra* were both vertical, the Lines which terminated the long Sides of them towards each other juſt touching, as appears in *Fig.* 3. Then at the Diſtance of 9 Foot, looking thro' the Priſm *C* at the Paper thus colour'd, the red Half appear'd very much ſeparated from the Purple, the one ſeeming lifted up from the other; the Red or the Purple appearing the higheſt, according as the refracting Angle of the Priſm was either held upwards or downwards. The Phænomenon is much more diſtinct this way than any other; for the Paper not only ſeems divided into two, when it is coloured by a red and a purple Ray, but alſo by a Red and Blue, (*Fig.*4.) by a red and a green Ray, (*Fig.*5.) or indeed by any two Colours that are different, how near ſoever their Places in the *Spectra* be to each other. The Halves of the Paper appear, when view'd thro' the Priſm, to be farther from each other, when the Paper is ting'd with ſuch Colours as are farther from each other in the Series of Colours in the *Spectrum*: and neareſt, tho' ſtill divided, when neighbouring Colours fall upon the Paper, as Yellow and Green, or a light and a deep Green. But the Paper appears no way divided, when colour'd with the Red of the two *Spectra*, (*Fig.* 6.) if thoſe Reds are equally intenſe: and ſo of the other Colours.

EXPERIMENT III.

I held a Lens of about 3 Foot Radius at the Diſtance of Six Feet from the oblong Paper (on which a red and purple Ray falling, made it look half Red and half Purple) and I projected the Image of the ſaid colour'd Paper at the Diſtance of about Six Foot on the other Side of the Lens, on a white Sheet of Paper ; where it was obſerveable, that when the red Half was diſtinctly painted on the white Paper (which was known by the Edges of the Image being regularly terminated) then the blue Half of the Image was confus'd: but if the white Paper was brought about two inches nearer to the Lens, the Image of the blue Half became diſtinct, and that of the red Half confus'd.

I try'd the Experiment with a Paper colour'd half red and half blue the red with Carmine and the blew with Smalt, making the Candle to enlighten the Paper (the Room being otherwiſe dark) and the Experiment ſucceeded in the ſame manner. The Experiment thus made is the ſame that Sir *Iſaac Newton* gives an Account of, *Book* 1. *Part.* 1. *Theor.* 1. *of his Optics.* Only it is to be obſerv'd that when the oblong Paper is coloured with red and blue from the Priſms, the focal place, where the red part of the Image is diſtinct, is more diſtant from the place where the blue part of the Image is diſtinct, than when the Paper is colour'd with the Painter's Powders, and much more vivid.

The *7th* Figure ſhews the Projection of the Paper ting'd with the Rays; and *Fig.*8. the Projection of it when painted: where a black Thread is wrapp'd round the red and the blue part, that the Diſtinctneſs of the Image of the Thread may ſhew when the red or when the blue part of the Image of the Paper is moſt diſtinct.

N. B. When the Candle enlightens the painted Paper, ſet an opaque Body as *B* between the Candle and Lens; leſt the Image of the Candle being alſo projected ſhould diſturb the Experiment.

EXPERIMENT IV.

Having made an Hole of ¼ Inch Diameter in the Window-Shut of the darkned Room, I ſuffer'd a Sun-Beam to come into the Room, which I intercepted with a Priſm at the Diſtance of 5 Inches from the Hole; and after its Refraction in paſſing thro' the Priſm, I receiv'd it upon a Sheet of white Paper, where it was colour'd, making an oblong Image of the Sun or *Spectrum* of about 9 Inches in length and 2 in breadth, which Breadth was nearly equal to the Diameter of the round Image of the Sun received upon a Paper at the ſame Diſtance from the Hole, which here was 18 Foot. Or if the Sun be too high, a Looking-Glaſs being put in the room of the Priſm will throw a white round *Spectrum* upon the Paper, which held at the ſaid Diſtance of 18 Foot, will have its Diameter equal to the Breadth of the colour'd *Spectrum*.

The Colours of the *Spectrum* were theſe; Red, Orange, Yellow, Green Blue, Purple and Violet, tho' the Violet was ſo faint in this as to be ſcarce perceivable. *See Fig*. 9.

N. B. The Axis of the Priſm in this, and all the other Experiments hereafter mention'd muſt be perpendicular to the Ray that falls on it; and the Plane into which the Ray enters muſt be held in ſuch a Poſition, that the Angle which ſuch a Ray makes with that Plane when it enters, may be equal to the Angle made by the middle Line of thoſe Rays which emerge after Refraction, on the other Side of the refracting Angle of the Priſm, with the Plane out of which they emerge. That is $\angle BDG = \angle AEH$

If the Plane *AC*, on which the Sun-Beam falls, be turned nearer to a perpendicular to the Sun Beam than before, the *Spectrum* will be much longer: if it be more inclin'd to the ſaid Beam, the *Spectrum* will be ſhorter, and in both Caſes leſs diſtinct. See the *Spectrum D E* and the *Spectrum d e* in *Fig*. 10. and 11. where *H*, *h*, repreſents the Hole in the Window-Shut in each Caſe; *A C*, *a c* the Plane of the Priſm on which the Rays enter; *B C*, *b c* that out of which they emerge; *P*, *p* the perpendicular, and *C*, *c* the refracting Angle.

If the Plane *A C* be ſtill more oblique to *H F*, all the Light will be reflected, and there will be no colour'd Image or *Spectrum* made by Refraction at all. *Fig.* 12.

But if it be held ſo as to be more nearly perpendicular to the Sun Beam than in *Fig.* 10. the whole Beam will indeed enter the Priſm; but meeting with *B C* the lower Surface of the Priſm, or rather the Surface of the Air contiguous to it, ſome of the Light will by the Plane *B C* be reflected to *d e*, paſſing almoſt perpendicularly thro' *A B*; and the reſt will emerge thro' *B C*, and by Refraction make the imperfect Spectrum *D E*. See *Fig.* 10.

If the Sun-Beam enter *A C* perpendicularly and in the middle of it, the Light will be all reflected as in *Fig.* 13. ſome of it by the Plane *B C* to *R*, and the reſt by the Plane *A B* to *p*. But if the Beam fall nearer to *A* (ſtill perpendicularly) it will all be reflected by the Plane *A B*; if nearer to *B*, it will be all reflected by the Plane *B C*.

In order therefore to have the colour'd *Spectrum* as it ought to be, care muſt be taken that the emerging coloured Light may make the ſame Angle with the Plane *B C*, as the immerging Light does with the Plane *A C*; that is, the Angle *A E H* muſt be equal to *B D G*, as was ſaid before, *Fig.* 9. which may alſo be ſeen on the enlightned Duſt in the Air. But the beſt way is to turn the Priſm on its Axis, and at the ſame time look at the colour'd *Spectrum*, which will riſe and fall and become longer or ſhorter as you turn the Priſm; and between the Aſcent and Deſcent of the Image, it will appear ſtationary: there ſtop the Priſm, and the Reflection will be ſuch as is required for all the Experiments hereafter mention'd.

In order to have the Priſm move freely on its Axis, and ſtop any where, I fix'd each End of it into a triangular Collar of Tin, from the End of which came a Wire, which was the Axis of the Priſm produc'd; and ſo I laid it on two wooden Pillars, with a Notch on the Top to receive the Wires, and fix'd it to a ſmall Board juſt broad enough to ſtand faſt. See *Fig.* 14.

EXPERIMENT V.

I took the Priſm *C D*, and thro' it look'd at the coloured *Spectrum R P*, which appear'd then round and white as at *S* juſt as if it had been the Sun's Light received on a Paper from the Hole *H*, and ſeen with the naked Eye. In this caſe the Priſm *C D* muſt be held *in directum* with *A B*, and the refracting Angles in the two Priſms muſt be equal. This *Spectrum* appearing white but juſt in one Point, is not ſo readily found; but the beſt way is to look thro' the ſame Priſm *A B* which makes the *Spectrum*, which may eaſily be done if it be pretty long, and then *R P* will be ſeen white and round, and as at *S*, as if coming directly from *H*. See Fig. 15.

EXPERIMENT VI.

I held a broad *Lens L l*, ground to a Radius of 2 ½ Feet, in ſuch manner that the whole colour'd *Spectrum* fell upon it; and after Refraction all the Colours appear'd to converge, if receiv'd on a Paper at *p p*; but when the Paper was held in the Focus at *F* in the poſition *π F π*, the *Spectrum* was round and perfectly white by the Union of all the colour'd Rays. If the Paper was held at Π Π, the Colours appear'd to diverge from each other, but then the Red was uppermoſt, which before us'd to be the loweſt, and ſo on in an inverted Order.

I try'd the ſame Experiment with a *Lens* of one Foot Radius, with one of 9 Inches, and with another of 7, and the Succeſs was the ſame. See the 16*th* Figure, where the *R*, *O*, *T*, *G*, *B*, *P*, *V*, expreſs the Colours.

N. B Care muſt be taken that the very end of the Red, and the Extremity of the Violet be taken in by the *Lens*; otherwiſe the *Spectrum* will not be perfectly white at the Glaſs's Focus.

There is no fix'd Diſtance of the Priſm from the Lens, but it ought to be brought ſo near the Priſm that the two Ends of the *Spectrum* may fall nearer the Axis of the Lens than the Edges of the Lens; becauſe there the Refraction is not ſo regular.

Behind the Lens *L*, which made the Colours converge into White at the diſtinct Baſe or Focus *F*, I plac'd the Lens *l*, which made the White be at *f* the diſtinct Baſe of the two Glaſſes combin'd; and the Experiment ſucceeded as before. Fig. 17.

When the Paper was held in the Focus of the Lens, ſo as to receive the white Image of the colour'd *Spectrum* projected by the Lens; if with a Card I intercepted the red Ray, the White appear'd ting'd with Purple, and if I intercepted the Violet or purple Ray, or both, the White appear'd ting'd with Red; and if the Red was intercepted at the ſame time, the *Spectrum* appear'd to be a Mixture of Yellow, Green and Blue. If any ſingle Colour was ſuffer'd to fall upon the Lens, the reſt being intercepted, that Colour wou'd continue the ſame; only it wou'd be more intenſe in the Focus of the Lens.

EXPERIMENT VII.

I took a Board (*Fig*. 18.) *q h s* which ſtood reclining on a Prop *t*, having an Hole of a Quarter of an Inch Diameter at *h*, and behind it a Priſm *B* ſupported on two Props, as above-mention'd, ſo as to turn eaſily about its Axis; and having ſet this Board on the Ground with the Priſm behind it at *B*; by turning the Priſm *A C* about its Axis, I firſt made the red Ray of the colour'd *Spectrum*

paſs

paſs thro' the Hole *h*, and fall obliquely upon the ſecond Priſm *B*. This Ray after its Refraction in paſſing thro' the ſecond Priſm, was carried up to the Ceiling of the Room at the place mark'd *R*: then I made the purple Ray fall upon the Board, and paſs thro' the Hole *h*, as the Red had done before; and after Refraction thro' the Priſm *B* it was carried up to the Ceiling at *P*. And the green Ray being afterwards made to paſs the ſecond Priſm in the ſame manner, went up to *G*: and ſo of all the intermediate Rays, which were by this ſecond Refraction thrown to the intermediate places on the Ceiling between *R* and *P*.

Care is to be taken that the ſecond Priſm be plac'd oblique to the Rays which come thro' the Hole *h*, leaſt they be reflected, as they wou'd be, if the Board being in the Poſition *Q S*, and the ſecond Priſm in the Poſition *L N M*, the Ray from the firſt Priſm be *ρ h*; for then it will be reflected upwards to *σ* inſtead of being refracted (*Fig*. 19.). Neither muſt the Plane of Immerſion be too oblique, leaſt the Incident Ray be reflected downwards by it, as the Ray *R h* is by the Priſm *B* thrown to *E*, in *Fig*. 20. Several have confeſs'd to me that they at firſt us'd to fail in this Experiment, for want of ſetting the ſecond Priſm in a due Inclination.

Tho' the Colours by the ſecond Refraction on the Ceiling appear'd unchang'd, when ſeen by the naked Eye, yet if view'd thro' a Priſm, they afforded new Colours (except ſome part of the Red, and ſome part of the Violet) which was owing to their not being fully ſeparated; for which reaſon I made the following Experiment, to prove that if the Colours be well ſeparated, they are truly homogeneal and unchangeable.

N. B. When the Priſms are good, and no Clouds are near the Sun, the Extremity of the Red or Violet will afford unmix'd Colours in this Experiment; otherwiſe not.

EX.

EXPERIMENT VIII.

Having made a Hole in the Window-Shut 2 Inches wide (*Fig.* 21.) I applied to it a Tin Plate, which ſliding up and down hid all this Hole in the Wood, and only tranſmitted a ſmall Beam thro' it's own Hole *H*, whoſe Diameter was $= \frac{1}{16}$ Inch. This Beam, by means of the Looking Glaſs *L*, plac'd on the Board of the Window *XW*, I reflected horizontally to the other end of the Room. But to correct the Irregularity of the Reflection of the Looking-Glaſs, I made uſe of the Frame of Paſt-Board *Pp*, which had an Hole in it *h* of $\frac{1}{16}$ Inch likewiſe: and placing it at *Pp* I ſuffer'd ſome of the reflected Beams to paſs thro' it, ſo as to fall upon the Lens *FE* (convex on both Sides, and ground to a Radius of $4\frac{1}{2}$ Feet) at the Diſtance of 9 Feet, ſo that the Image of the Hole *h* was projected to *f* on the other Side of the Glaſs, at the Diſtance of 9 Feet more. Juſt behind the Lens, which by a Screw in the Stand *S* might be rais'd or let down, ſo as always to receive the Beam along its Axis, I plac'd a Priſm *A* (upright on one of its Ends and eaſily moveable about its Axis, by reaſon of its Wire turning freely in an Hole in the ſolid piece of Wood *T*, which ſtood on another Stand behind the Lens) as near as I cou'd to the Lens *E F*, ſo that the Image of *h* inſtead of being round, white, and projected to *f*, was caſt ſidewiſe on a white Paper ſtretch'd on a Frame, and appear'd colour'd, and 30 or 40 times its Breadth, as at *M N*. The Colours in this Caſe were very vivid and well ſeparated, only the Violet had ſome pale Light darting from its End, upon account of ſome Veins in the Priſm *A*, and the Light not coming directly from the Sun, but reflected; which ought not to have been, if the Sun had been low enough to have thrown the Rays a good way into the Room without the Help of a Looking Glaſs.

To ſhew that the Colours in this *Spectrum* were ſimple and homogeneal Lights, I made the following Experiments.

EXPERIMENT IX.

Having made an Hole *h* in the Paper which receiv'd the colour'd *Spectrum*, I ſuffer'd the red Light to paſs; which being refracted by a ſecond Priſm, fell upon another Paper at *T*, where it appear'd ſtill Red whether ſeen with the naked Eye or Priſms of different refracting Angles. To the Eye which ſaw it thro' the Priſm *V*, it appear'd indeed lower as at *t*, but red, round and unchang'd. I made the Experiment upon all the Colours, which by this means appear'd to be ſimple and homogeneal. See *Fig.* 22. Where the ſame Letters denote the Lens, Priſm and firſt Paper.

Thro' the ſame Lens and Priſm the *Spectrum* was made to fall on a Book; then thro' the Priſm *F* it appear'd unchang'd; and the Letters in the Book which croſs'd the *Spectrum*, were as diſtinct as when ſeen with the naked Eye See *Fig.* 23.

N B. The Axis of the Priſm *F* ought to be perpendicular to the long Axis of the *Spectrum, s m* thrown on the Book, which will appear as at $\sigma \mu$; and the Priſm in the Poſition repreſented at *F*, with its flat Side towards the Noſe: for that is the moſt convenient Poſition for looking at the *Spectrum* in theſe Experiments.

I ſuffer'd the purple Ray only to paſs thro' the Hole *h* and fall upon a Book at *P*, the Letters of which appear'd at π, and were as diſtinct thro' the Priſm *Q* as when ſeen with the naked Eye: and I had the ſame Succeſs with all the other Rays. See *Fig* 24.

But if a Sun-Beam as *r* comes thro' the Hole *H* directly upon the Book at *W*, an Eye looking at it thro' a Priſm at *X* will ſee this Beam at *Y* oblong and colour'd, and the Letters on which it falls, confus'd. See *Fig.* 24.

N. B. The Lens ought to be very good, without Veins or Blebs, and ground to no leſs a Radius than I mention'd in the Experiment; tho' a Radius of a Foot or two longer is not amiſs. The Priſm ought to be of the ſame Glaſs as the Object-Glaſſes of Teleſcopes, the white Glaſs, of which Priſms are uſually made, being commonly full of Veins. And the Room in theſe laſt Experiments ought to be very dark.

A few Days after, having got very good Priſms made for the purpoſe of the above mention'd Glaſs, I made all the Experiments over again before ſeveral Members of the *Royal Society* with better Succeſs; and had the *Spectrum* very regularly terminated, without any pale Light darting from the Ends of it.

For a further Account of Experiments to this purpoſe, ſee Sir Iſaac Newton*'s* Opticks. B. 1. Part. 1. to which I might have referr'd the Reader altogether; but that I was willing to be particular in mentioning ſuch things as ought to be avoided in making the Experiments above-mention'd; ſome Gentlemen abroad having complained that they had not found the Experiments anſwer, for want of ſufficient Directions in Sir *Iſaac Newton*'s *Opticks*; tho' I had no other Directions than what I found there.

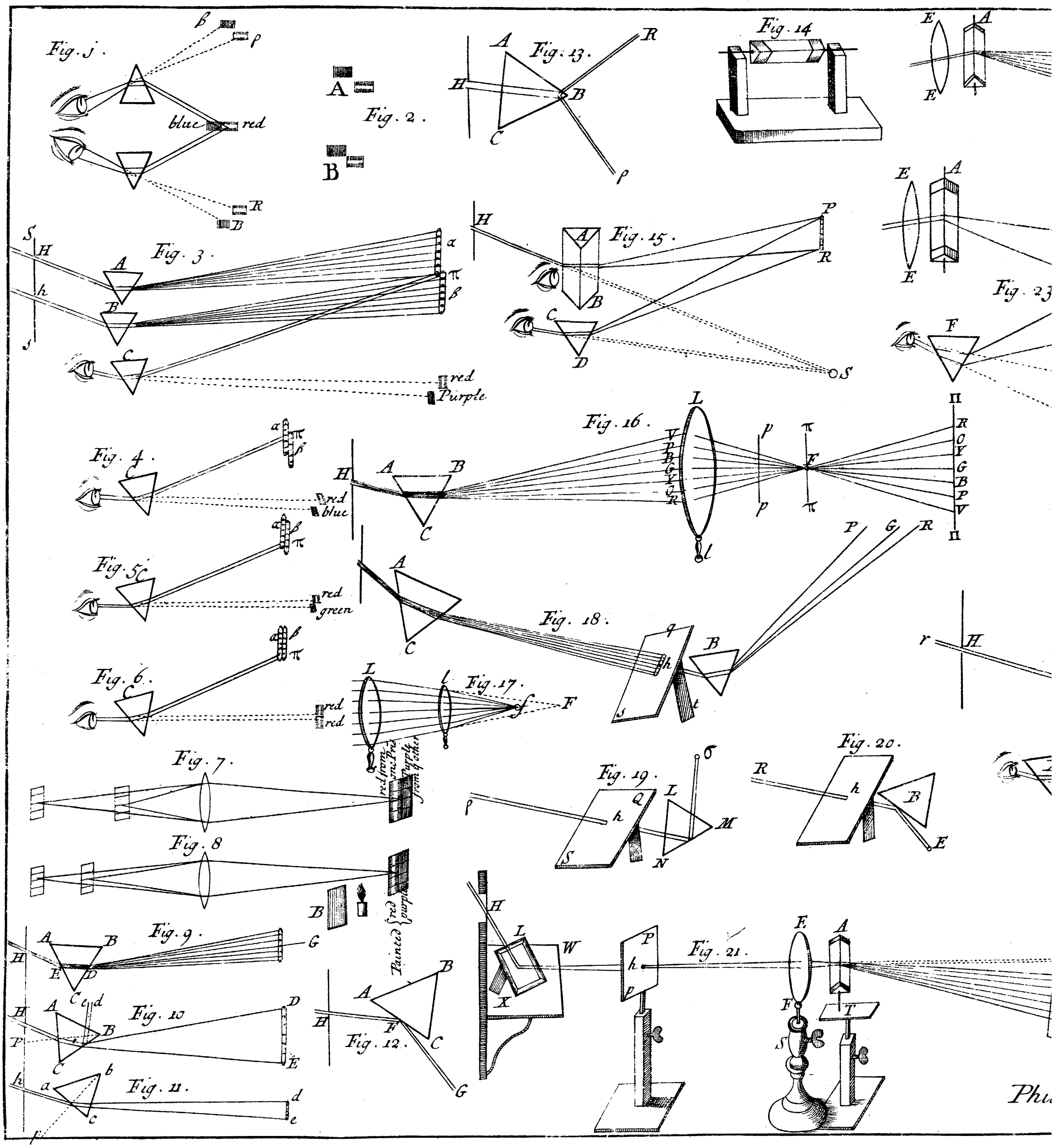
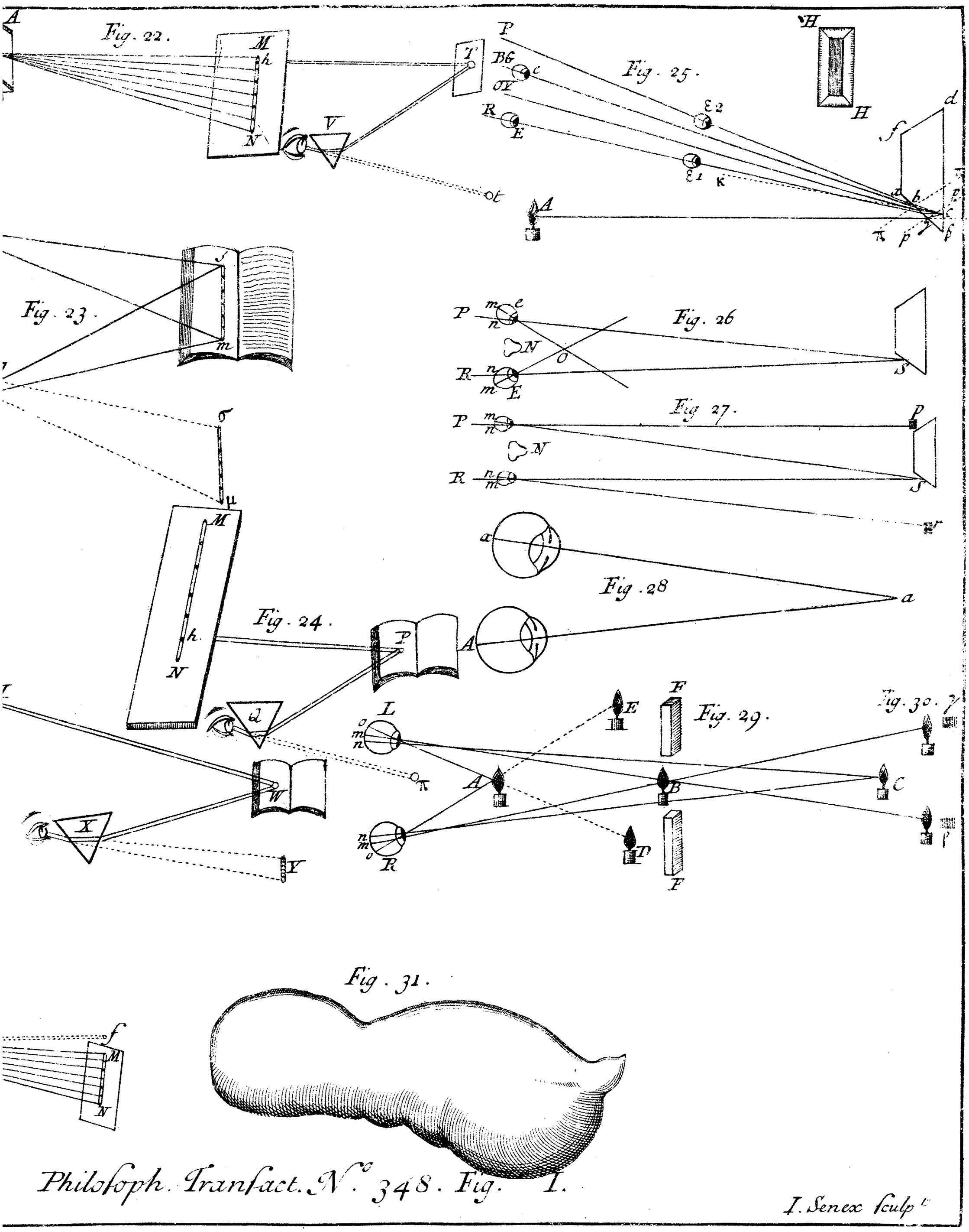
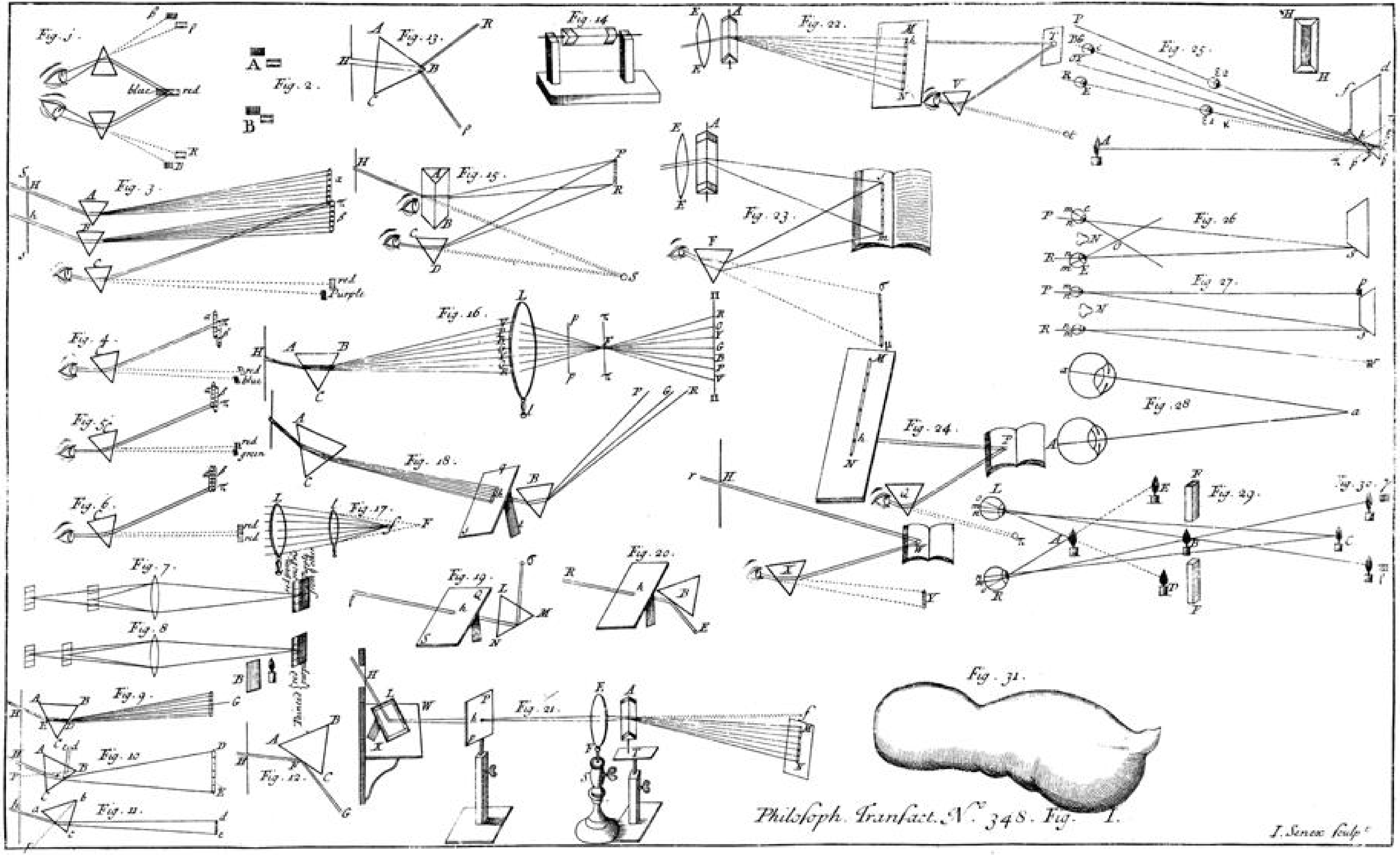


Fig. 1.
β
ρ
blue
red
R
B
A
Fig. 2.
B
Fig. 13.
A
R
H
B
C
ρ
Fig. 14
E
A
E
E
A
E
S
H
Fig. 3.
A
h
B
s
C
α
π
β
red
Purple
H
A
Fig. 15.
P
R
B
C
D
S
Fig. 23
F
Fig. 4.
C
a
π
β
red
blue
H
A
B
C
Fig. 16.
L
V
P
B
G
Y
O
R
p
p
π
F
π
Π
R
O
Y
G
B
P
V
Π
l
Fig. 5.
C
a
β
π
red
green
A
C
Fig. 18.
P
G
R
q
h
B
s
t
r
H
Fig. 6.
C
a
β
π
red
red
L
l
Fig. 17.
f
F
red from one Prism
purple from the other
Fig. 7.
Fig. 8
B
Painted {red purple}
Fig. 19.
σ
ρ
Q
h
L
M
S
N
Fig. 20.
R
h
B
E
A
B
G
Fig. 9.
H
E
D
C
e
d
H
A
B
Fig. 10
D
P
C
E
h
a
b
Fig. 11.
d
c
e
p
A
B
H
F
Fig. 12.
C
G
H
L
W
X
P
h
p
Fig. 21.
E
A
F
T
S
Phi



Philoſoph. Tranſact. N°. 348. Fig. I.

I. Senex ſculp t.



Philoſoph. Tranſact. N°. 348. Fig. I.

J. Senex sculp.